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USSR: Forecasting and Planning Weapons Acquisition

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A Research Paper

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A Research Paper

This paper was prepared by [redacted] Office of Scientific and Weapons Research, with contributions from [redacted] 25X1 25X1
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USSR: Forecasting and Planning Weapons Acquisition 25X1

Summary

Information available as of 30 June 1987 was used in this report.

The Soviet military and defense industries engage in an extensive effort to identify future Western weapon systems and technologies and then forecast their own systems and research directions. These forecasts are developed, integrated, and approved as part of the process to identify and substantiate the Communist Party of the Soviet Union's (CPSU) "Main Directions of Economic and Social Development of the USSR." These military research and development subsets of the "Main Directions" are policy documents that guide the generation of weapons and technology requirements and the formation of five-year plans for military development. 25X1

The forecasting and planning process for Soviet weapons operates within the fairly inflexible schedule of the five-year planning process. Normally, major weapons development projects are forecast and planned two to three years before the start of a five-year plan if they are to be implemented within that five-year plan. The formulation of the five-year plan calls for decisions at specific times in the preparation process. Making prompt decisions within the planning schedule is one of the strengths of the Soviet acquisition process. We believe, however, that the system responds poorly to Western developments that occur after the five-year plan is finalized or after a key decision point has passed. If the Soviets are forced to respond to Western initiatives midstream in a five-year plan with new initiatives that consume substantial resources, major disruptions to the planning and resource allocation process can result. 25X1

The long Soviet leadtime (seven to 15 years) for responding to Western threats (systems) requires the Soviets to forecast threats far in advance so that they can field a timely response when the threats are deployed. For example, the Soviet ZSU-X radar-directed 30-millimeter (mm) battlefield antiaircraft artillery (AAA) system was designed in the 1970s as a response to US Blackhawk, Apache, and A-10 aircraft, which were being designed to operate in the less threatening 23-mm AAA environment. 25X1

Soviet threat forecasting is greatly eased by the open, largely unclassified workings of the Western weapons acquisition process. Specific information on the performance characteristics of planned Western systems is an essential element of the Soviet process. With a high level of confidence in their forecasts of threats from the West, the Soviets can better forecast

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their own systems and technology requirements. Classified "black" programs and deception that withhold key information regarding Western weapons program goals and system characteristics obviously impede to some extent the Soviet capability to respond to Western developments. 25X1

The Soviets view themselves as locked into a military-technical competition with Western designers. The competition is at the level of weapon system performance characteristics, not the technology embodied in the systems. The Soviets do not always develop systems that are the technological equal of Western systems nor do they always follow similar technological approaches in designing systems. The competition, however, keenly attunes Soviet designers to the capabilities and techniques of their Western counterparts. 25X1

Main directions set broad trends in weapon and technology development and allow the Soviets to maintain the momentum of a system design effort with a steady flow of new, usually evolutionary, designs. Thus, the Soviets can maintain approximate technical parity with the West without taking on technologically risky weapons development projects. They do have to design incrementally new or modified weapons more often but apparently accept this as the price of preventing Western military-technical superiority. This incremental evolutionary process accounts, at least in part, for the large numbers of major weapons systems (over 100) under development at one time. 25X1

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Introduction

Soviet five-year and annual economic plans encompass activities for industry, science and technology, transportation, agriculture, material and labor supply, investment, and other economic components from every organization, ministry, and region in the Soviet Union. Because market forces are lacking, economic activity is driven by and must be included in the plan. If one important part of the plan fails badly—steelmaking, for example—all parts that are affected must be recast.

A major part of the five-year economic plan is the "Plan for Military Construction," an integrated plan for the development of the Soviet armed forces. To formulate five-year plans, a lengthy preparatory effort is required. The military's preparation for the next five-year plan begins in the first year of the current five-year plan. The civilian ministries begin preparation a year or two later. We believe this puts the military in a strong position to get first call on resources.

The five-year horizon of the plan is too short to encompass the technology development, design, and preparation for production of major weapon systems. A long-term (15- to 20-year) forecast provides the overview and context for major development projects.

This study describes and assesses the Soviet military research and development (R&D) forecasting, programing, and planning process. It provides tools to identify weaknesses in the Soviet system that US weapons acquisition strategy could exploit and to identify Soviet forecasting techniques that the United States could use to better forecast future Soviet system and technology goals. For completeness, we include in the appendix a description of the Soviet scientific research and experimental design processes and a general comparison of US and Soviet weapons development processes. 25X1

This study has drawn on an extensive body of unclassified Soviet writings on the forecasting and planning process, on Soviet policies and problems of managing the introduction of technology into design and production, and on military forecasting. Open literature has been supplemented by Foreign Broadcast Information Service translations, 25X1 25X1

Forecasting: The Basis of Soviet Planning

Marxist-Leninist ideology presumes a knowable future based on the tenets of dialectical materialism. The Soviets claim their ideology is scientifically valid, dialectically logical, and historically proven. Their five-year planning process is intended to ensure that the future unfolds in an orderly, planned manner. Thus, the Soviets believe that the future not only can be forecast, but, given their planned economy, must be forecast. 25X1 25X1

Since the early 1970s forecasting future systems and technologies has taken on an increasingly important role in Soviet five-year plans. This emphasis can be traced to a 1968 joint resolution of the Communist Party of the Soviet Union (CPSU) Central Committee and the Council of Ministers "On Measures for Increasing the Efficiency of the Work of Scientific Organizations and Speeding Up the Utilization of Scientific and Technical Achievements in the National Economy." This resolution was the basis for several far-reaching reforms in the administration of science 25X1 and technology—both military and civilian. It called for the extensive use of forecasting in planning R&D projects and in capital investment. The resolution stated in part:

> *Consider it necessary that for the most important problems of development of the national economy and of its separate branches scientific-technical forecasts henceforth be drawn up for the long-term period (10 to 15 years and more), which must be the basis for selection of most long-term directions of technical progress and the effective paths of development of the national economy and of its separate branches.*

The 1968 joint resolution, in effect, firmed up the relationship between forecasting and the party congress document on "Main Directions of Economic and Social Development of the USSR." Main directions (*osnovnyye napravlenyye*) set the overall goals for the Soviet Union and give the five-year plan its political underpinnings. According to the Soviets, the forecast "scientifically substantiates" the five-year plan and party policy that guides the plan.

Earlier CPSU main directions had a five-year horizon. The main directions of the 26th Party Congress looked ahead 10 years to 1990. The main directions of the 27th Party Congress in 1986 looked out 15 years to the year 2000.

Since the early 1970s forecasts have been used to identify and "scientifically substantiate" the main directions of Soviet science and technology (S&T). During 1974 and 1975 the USSR Academy of Sciences conducted forecasts of S&T directions to be pursued during the 10th Five-Year Plan (1976-80). From 1976 to 1979 a large number of ministerial R&D organizations participated in forecasts that formed the basis for the 11th Five-Year Plan (1981-85) and looked out to 1990.

The current Soviet leadership is particularly intent on requiring the use of forecasts as the basis for planning. In August 1986, Lev Zaykov, then the Central Committee secretary responsible for defense industry, noted at a Central Committee Conference on Machinebuilding:

> *It is essential that there should be in every ministry a precise and scientifically based long-term forecast in every sector for the development of all types of technology, and that this should be used as a guide in drawing up five-year plans for creation of new types of articles.*

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Military Forecasting and Planning

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The 1968 decree stimulated a high level of S&T forecasting activity and precipitated several books and articles describing different types of military forecasting. As with S&T forecasting, military forecasts are used during planning. According to open sources, the results of military forecasting serve as a scientific basis for development of plans in military affairs. 25X1

The long Soviet leadtime (seven to 15 years) for responding to Western threats (systems) requires the Soviets to forecast threats far in advance so that they can field a timely response when the threats are deployed. For example, the Soviet ZSU-X radar-directed 30-millimeter (mm) battlefield antiaircraft artillery (AAA) system was designed in the 1970s as a response to US Blackhawk, Apache, and A-10 aircraft, which were being designed to operate in the less threatening 23-mm AAA environment.

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Open literature identifies five elements of military forecasting: military-political, military-strategic, operational-tactical, military-economic, and military-technical. Military-political forecasting is the newest element of military forecasting. Although it was first discussed in a 1979 *Military Thought* article, military-political forecasting may not have become an official part of the forecasting hierarchy until the mid-1980s. It first appeared in the 1986 *Military Encyclopedic Dictionary*. It forecasts the development

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of other states' military policies and the possibility and nature of military danger, tense relations, crisis situations, local conflicts, and world war. Military-political forecasting also works out recommendations regarding the goals and tasks of Soviet military policy and doctrine. The political leadership undoubtedly reserves to itself the final say on military policy and doctrine. [redacted]

Each element of military forecasting is designed to address one or more questions:

- Military-Political
  - What are the military policies and goals of foreign states?
  - What are the likely areas of military conflict?
  - What should be the military policy, strategy, and doctrine of the Soviet Union?
- Military-Strategic
  - What will be the character, objectives (military and political), and composition of forces in future wars?
- Operational-Tactical
  - What will be the means and methods of conducting future combat operations?
- Military-Economic
  - What will be the most effective quantitative and qualitative composition of armed forces to accomplish future missions with minimal expenditure of resources?
- Military-Technical
  - What are the potential characteristics of and the threat posed by future Western weapons and equipment?
  - What are the prospects for development of Soviet weapon systems and technologies? [redacted]

Military Technical Forecasting: A Key Element in Soviet Weapons Development

Military-technical forecasting is especially important because it is concerned with identifying future military systems and technologies—the essence of the future military power of the state. It also addresses the schedule of development and the cost. Military-technical forecasting has been described by Engineer Maj. Gen. Yuriy V. Chuyev as the most rapidly developing division of military forecasting. [redacted] 25X1

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The military-technical forecasts are, in effect, integrated research to substantiate the main directions of armament and military technology. [redacted] 25X1

[redacted] 25X1

[redacted] military-technical 25X1
forecasting is an integral part of the process to develop the "Plan of Most Important Research (NIR) and Development (OKR) for Armament and Military Technology" of the Five-Year Defense R&D Plan (see appendix).[1] It is an integrated effort involving many key military and defense-industrial organizations. [redacted] 25X1

According to the 1976 *Soviet Military Encyclopedia*, military-technical forecasting "provides data about possible tactical-technical characteristics of arms and military equipment, prospects for their future development and improvement, and the appearance of new types of weapons." The goals of military-technical forecasting include:

- Describing the capabilities of future weapons of the enemy and their initial operational capabilities.
- Assessing the threat posed by these future enemy systems.
- Preparation of data for weapons requirements which will "preclude military-technical superiority of the probable enemy." [redacted] 25X1

[1] Scientific research work (NIR—*nauchnaya issledovatel'skaya rabota*) is the stage of Soviet R&D concerned with research and technology development. Experimental design work (OKR—*opytnaya konstruktorskaya rabota*) is concerned with full-scale system development with the aim of introducing a new weapon into production. [redacted] 25X1

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Performance Indexes: The Basis of Military-Technical Forecasting

One goal of a Soviet military-technical forecast of a future foreign weapon system is the identification of performance characteristics for that system. The Soviets address a foreign threat system almost entirely in terms of its tactical-technical characteristics (*taktiko-tekhnicheskiye kharakteristiki*—TTKhs). With that threat forecast in hand, they forecast the performance characteristics of their future systems. The formal tactical-technical requirements for Soviet military hardware are derived from military-technical forecasting. In their authoritative book, *Forecasting in Military Affairs,* Chuyev and Yu. B. Mikhaylov linked threat forecasting, their own systems forecasting, and the importance of TTKhs:

> *The resolutions of the questions of developing a new type of weapon requires a forecast of the enemy's weapons and military equipment. . . . The question of whether there is a need to produce a new weapon is inseparably linked with the determination of its tactical-technical characteristics.*

The 1976 *Soviet Military Encyclopedia* describes TTKhs as "the aggregate of quantitative characteristics of a model or piece of military equipment organized in accordance with a designated scheme, which determine its properties." TTKhs are the mission-important characteristics of a system. For example, the principal TTKhs for a reconnaissance system are:

- Probability of target detection of a specific target at a given range.
- Maximum and minimum ranges.
- Accuracy in determining target coordinates.

Other TTKhs considered important for all military hardware, regardless of function, include reliability, survivability, and resistance to interference.

Although the expression tactical-technical characteristic is most commonly used to describe military system performance indexes, Soviet open literature sometimes refers to performance indexes using different terminology. In practice, however, all the terms have the same meaning. For example, tactical-technical data and flight-technical characteristics are used to describe helicopter and aircraft performance indexes. Performance characteristics for ships and submarines are called tactical-technical elements. These include armament composition, displacement, speed, and range, and, for submarines, dive depth, autonomy, type of power plant, and security from enemy detection. 25X1

The Soviets take into account disparities in TTKhs of their and foreign systems in planning operations and tactics. They also model operations and tactics to identify the most important TTKhs. 25X1

Forecasting Methodologies

Soviet forecasters use one or a combination of three basic forecasting techniques: extrapolation, mathematical modeling, and polling of experts (heuristics). Extrapolation and mathematical modeling are used primarily for short-term military-technical forecasting. Extrapolation identifies trends in TTKhs—such as the increasing bore of tank main guns or the higher resolution of side-looking radars. Mathematical modeling of conditions of use are used to identify the most important TTKhs of a system and their role in system performance. For the longer term, where conditions are less well known and less quantitative precision is required, heuristic forecasting is used. 25X1 25X1

For technology forecasting, the Soviets make extensive use of Western forecasting techniques and information resources. They statistically analyze patent information and have developed or acquired the tools to analyze scientific literature data bases. Such analysis can identify those areas of greatest scientific interest or activity. 25X1

One Western impetus to Soviet military-technical forecasting was the Honeywell-developed Pattern system (Planning Assistance Through Technical Evaluation of Relevance Numbers). Pattern was used by the US Air Force in the early 1960s to support planning of US aerospace systems and was expanded to encompass the development of all military and space-related science and technology. Of particular interest to the 25X1

Soviets is the applicability of this method to identify an optimal national strategy to budget resources for the development of new weapons systems over a 10- to 15-year period. The Soviets believe the advantage of the Pattern method is that it facilitates the determination of relative priorities and means for achieving multiple goals. It directs resources toward the accomplishment of primary tasks without neglecting secondary ones, enabling a more systematic analysis of all problems.

Although specific applications of Pattern to Soviet military-technical forecasts have not been made public, the frequency with which references to this method appear in Soviet forecasting literature suggests strongly that the Soviets probably have adopted some techniques of Pattern's goal-oriented forecasting. They almost certainly have tried to use Pattern to emulate US forecasts and refine their threat forecasting. Conversely, as we acquire a better understanding of Soviet forecasting techniques, we might be able to emulate their forecasts.

The Soviets use two basic types of forecasts in support of planning—estimative and normative. Estimative forecasts seek a probabilistic assessment of the occurrence of events—for example, the probability that gallium-arsenide technology will be mature enough for weapons applications in the 12th Five-Year Plan. Forecasts of the occurrence and characteristics of foreign systems are estimative forecasts. Normative forecasts start with a goal (either a new system or technology) and forecast various paths to reach it. The goals of normative forecasts are supplied, in part, by CPSU policy and military-strategic, operational-tactical, and military-economic forecasts. Normative forecasts form the basis for the development of main directions. The main directions forecast, in turn, supplies paths to the goals. The five-year plan selects an optimal path and directs the responsible organizations to achieve the goal.

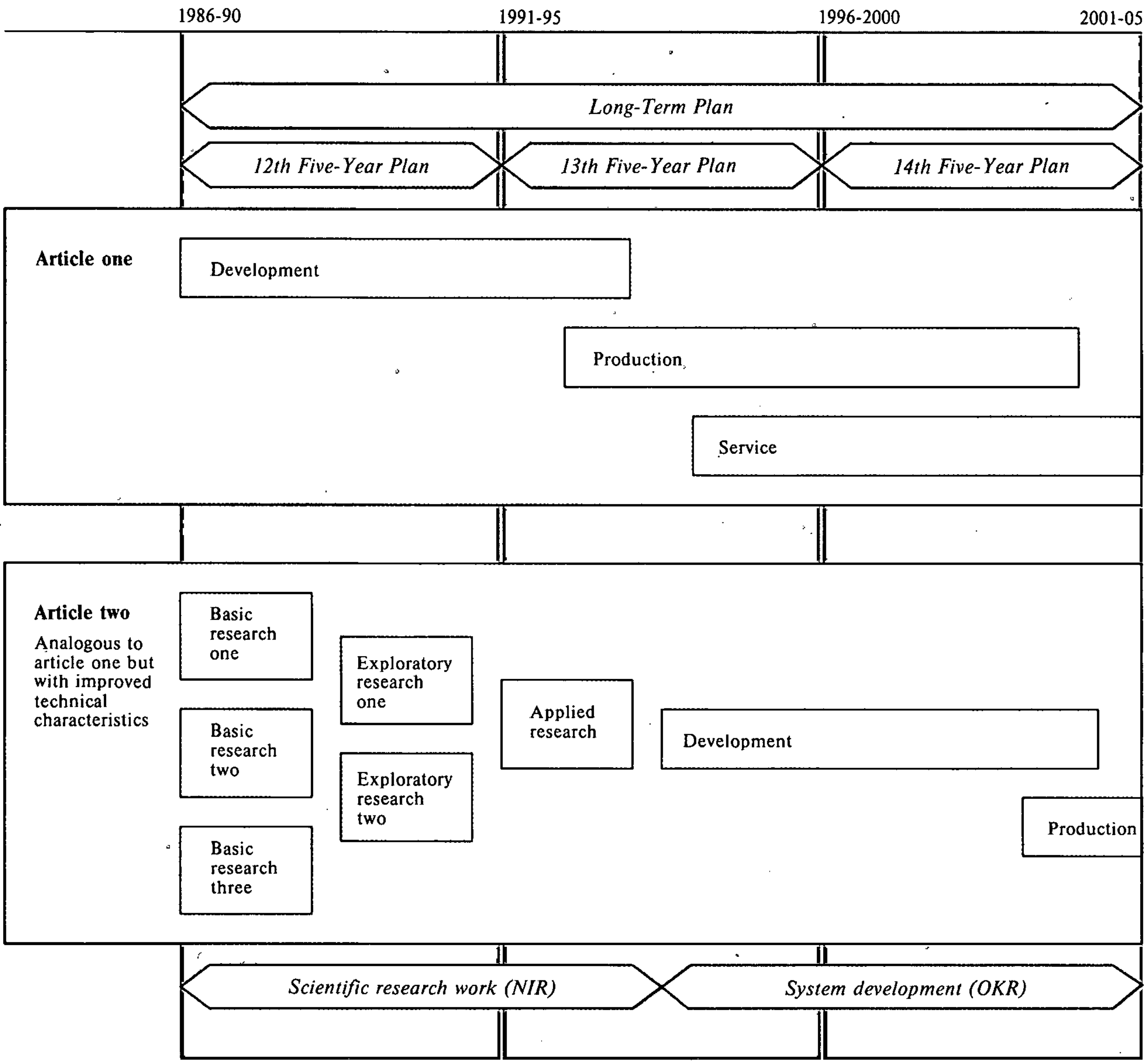
Main Directions: The Results of Military Forecasting

The result of the overall military forecasting effort is a draft of the main directions of weapons and technology development activity for a period extending 15 years into the future. The draft proposes specific programs for near-term military system development (OKR) and longer term technology development programs (NIR). Individual service forecasts are integrated at the Ministry of Defense level. The draft probably is approved in principle by the Defense Council about two years before the start of the five-year plan. The main directions draft becomes party and government policy, serves as the basis for generating requirements for new systems and for technology development, and is a basic planning document for the forthcoming five-year plan. 25X1 25X1

Availability of enabling technology to achieve specified TTKhs is one of the determining factors in how a main direction is implemented. If the technology base for a required system is available, main directions allow for the initiation of a weapons development program (OKR) within the next five-year plan. If the technology base needs to be developed or matured to initiate OKR programs in the 10- to 15-year horizon, main directions call for NIR in the next five-year plan. 25X1 25X1

For example, a main direction in antiship cruise missiles might forecast the beginning of development of a new missile in the 12th Five-Year Plan. It might also forecast additional research on seeker and propulsion technologies in the same five-year plan to support the forecasted start of a new missile program in the 13th Five-Year Plan. Thus, a main direction allows the Soviets to maintain the momentum of their antiship cruise missile effort with a constant flow of new, usually evolutionary designs. We believe the Soviets strive to maintain approximate technical parity with the West without taking on technologically risky weapon development projects. They do have to design incrementally new or modified weapons more often but accept this as the price of preventing Western military-technical superiority. Figure 1, which is based on a Soviet graphic, shows how main directions include research, design, and production. 25X1 25X1

Figure 1
A Main Direction as a Planning Mechanism[a]



[a] A main direction defines a weapon type or mission. It forecasts future systems and provides for the enabling technology that makes possible improved performance characteristics. In this case, a hypothetical weapon system family—such as an intercontinental ballistic missile and its planned modernized version—and its supporting technologies would be part of a single main direction.

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The Five-Year Plan: Constraints and Opportunities

The military-technical forecasting effort for the next five-year plan probably begins in the first year of the current plan. It takes its goals from the policies embodied in the main directions and military-technical policy approved at the most recent party congress. The Soviet military forecasting effort for the 1991-95 five-year plan is now under way, based on the military policy directions of the 27th Party Congress, which was held in early 1986 (see figure 2).

The relatively rigid five-year forecasting/planning cycle both contributes to and detracts from the decisionmaking process. The cycle provides the Soviets with a decisionmaking process that is significantly shorter than in the US acquisition process. They have specific periods every five years for developing forecasts and requirements and for making decisions about weapons development. We believe the system is most flexible in planning for the next five-year plan during the first three years of the current five-year plan. After the probable Defense Council approval of the main directions (two years before starting the five-year plan), the system begins to lose flexibility. For example, if R&D involving large expenditures were required, the Soviets would have difficulty responding quickly to Western initiatives after 1989 because they would be forced to alter the 1991-95 plan. They would experience considerable administrative difficulty after the 13th Five-Year Plan begins in 1991.

In the research (NIR) area, we believe the Soviets could more readily respond to Western initiatives. The defense industrial ministries typically set aside a sizable 15 to 25 percent of their research budget as a reserve for unforeseen contingencies, such as new ideas or Western challenges.

The Soviets rarely significantly change the design of a system already in development. The Soviets are more concerned about disruptions to the resource allocation process than they are attracted by advantages gained by an earlier fielding of a particular capability. Rather, the Soviets probably would initiate a program to develop a modernized version at the earliest opportunity. This policy allows them to move systems quickly to deployment.

The Players in Military Forecasting

According to the 1976 *Soviet Military Encyclopedia*, the Soviet General Staff is the principal organization responsible for military forecasting. We believe that Gen. Vitaliy Shabanov, Deputy Minister of Defense for Armaments, working closely with the General Staff and the Military-Industrial Commission, integrates military-technical forecasts prepared by Ministry of Defense and service technical directorates and 25X1
their subordinate military scientific research institutes. 25X1

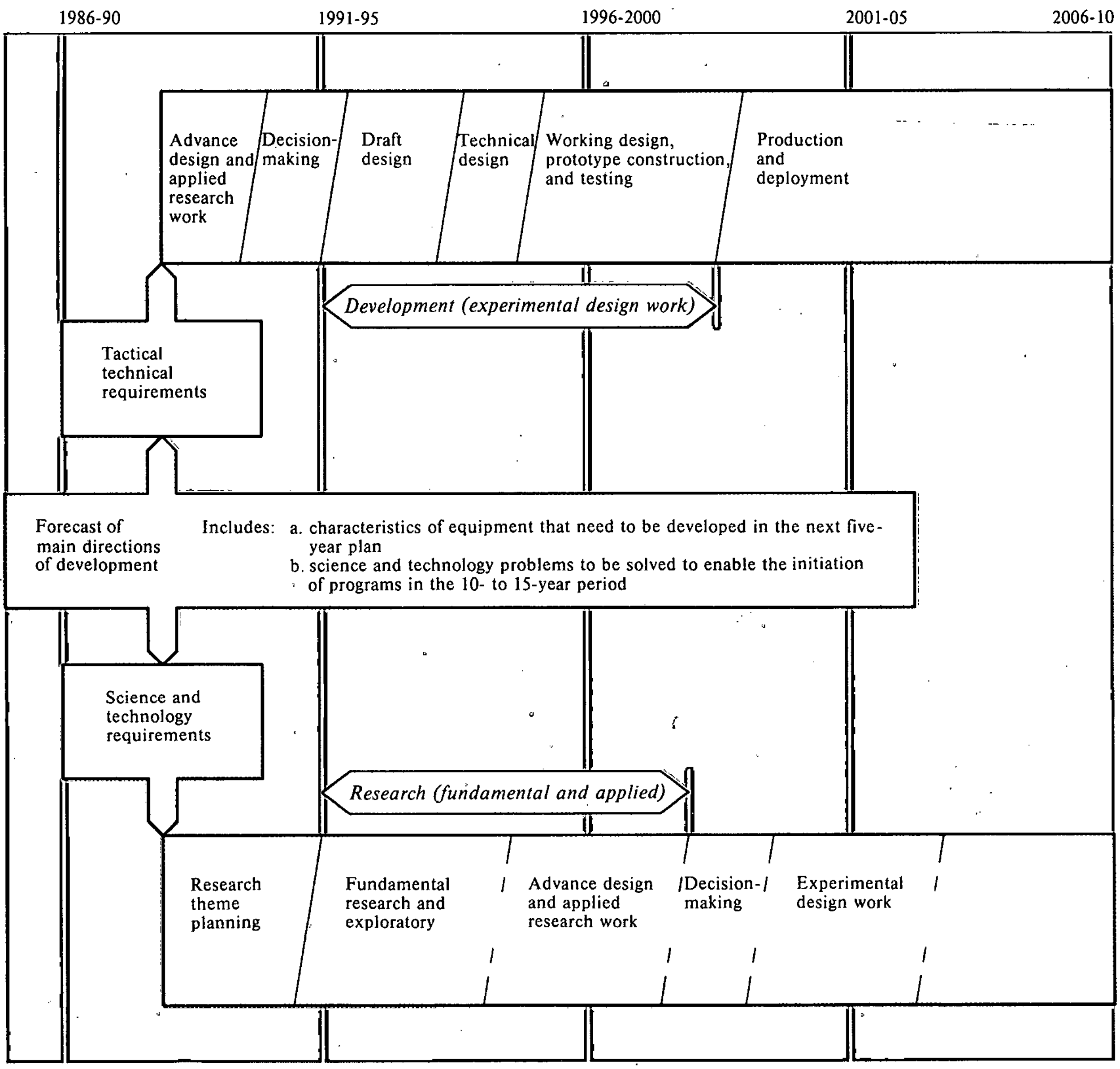
The Ministry of Defense and each service have subordinate main technical directorates that are responsible, among other things, for the formulation of requirements for future military systems and for the establishment of main directions for related scientific research work and systems development (see figure 3). The forecasting role of the Chief Directorate for Shipbuilding and Armament of the Navy (GUKV) was revealed in the June 1986 issue of *Morskoy Sbornik*, where Engineer Vice Adm. Ivan I. Tynyankin describes "Main Direction for the Development of Shipbuilding Technology." Admiral Tynyankin is Deputy Chief of GUKV. His article appeared soon after the meeting of the 27th Party Congress and cites its "Main Directions" as guidance. 25X1

Subordinate to these main technical directorates are the military-scientific research institutes (NII-MOs). NII-MOs act as systems analysis and forecasting 25X1
agents for their services and have primary forecasting responsibilities within their area of expertise. The NII-MOs work closely with research institutes and design bureaus in the defense industrial ministries. Some design bureaus in the Ministry of Aviation Industry, for example, have sections dedicated to forecasting the evolution of aircraft. Through the 25X1
NII-MOs the main technical directorates are kept informed on the state of the art in military-related technologies and formulate requirements for system and technology development accordingly. 25X1

USSR Academy of Sciences

Some S&T forecasting for the military is performed by the Section on Applied Problems of the Academy of Sciences, headed by Chuyev, one of the preeminent 25X1

Figure 2
Main Directions and the Five-Year Planning Cycle[a]



[a] Every five years the Soviet military completes a major forecast of future foreign and domestic weapon systems. These forecasts are integrated and submitted to the Defense Council for ratification. Once approved, they become party policy and are expressed as main directions. Main directions are used to justify military research and development activity in the next five-year plan. After their approval, system and science and technology programs are incorporated into the "Plan of Most Important NIR and OKR," the military research and development section of the Five-Year Defense Plan.

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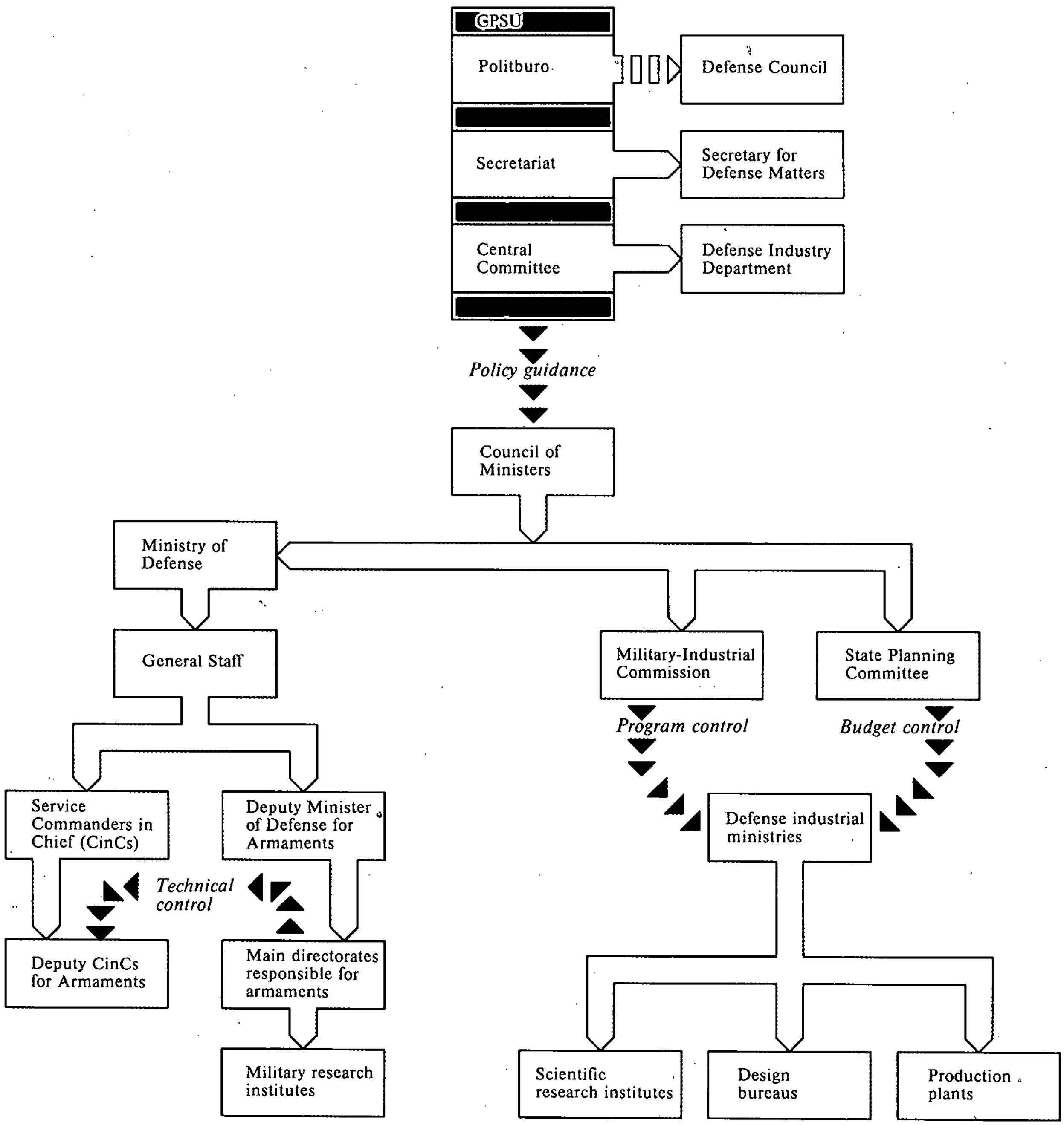
Figure 3
The Players in Military Forecasting



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military technology forecasters in the Soviet Union. Chuyev was formerly associated with an air academy in Kiev, where he worked on air defense problems. General Chuyev's rise to prominence is probably closely tied to the party's demand for forecasting. [redacted]

The Section on Applied Problems tasks specialized councils in the Academy of Sciences to provide forecasts of militarily important science and technology. The Council on Cybernetics and the Council on Holography are known to have provided such forecasts. These councils provide a mechanism for the military to tap the expertise of leading academicians and scientists. [redacted]

How Forecasting Supports the Planning Process

[redacted] from the mid-to-late 1970s, leading Soviet military and defense-industrial R&D organizations participated in a project to forecast future military systems and technologies. The project was conducted as part of the process to develop the 11th Five-Year Plan (1981-85). [redacted]

The primary organizations responsible for carrying out the forecasting project were the NII-MOs, which are subordinate to the technical directorates of the services and to the Ministry of Defense. [redacted]

The principal phase of the forecasting effort ended in mid-1978, when the military had identified the missions, applications, and characteristics of future weapons out to 1995—the main directions draft of armament development. [redacted] 25X1

After that coordination in the third year, tactical-technical requirements were formulated for specific systems and technologies called for in the main directions. [redacted] 25X1

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This military-technical forecasting effort reflects a concerted, nationwide program to tie scientifically substantiated, long-range goals directly to specific programs within the framework of the five-year planning process. The current political leadership has focused on forecasting—with a view toward competing with Western technical achievements—as a prerequisite to a high level of S&T achievement. [redacted]

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Competition With the West

The goals and nature of military competition with the West have not remained constant. According to the 1976 *Soviet Military Encyclopedia*, "Soviet military doctrine . . . gives a program of actions for guaranteeing military-technical *superiority* over the armed forces of probable enemies [emphasis added]." After 1977 Soviet declaratory policy on military-technical superiority shifted to "*achieved parity* [emphasis added]:"

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> *The USSR does not take for itself the task of achieving military-technical superiority, but will not allow the attainment of superiority by imperialist countries over us. The USSR decisively comes out against the arms race, for maintaining the achieved parity in the area of arms and for lowering their levels.* [redacted]

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Figure 4
Timing of Five-Year Plan Decisions

	First Year	*Second Year*	*Third Year*	*Fourth Year*	*Fifth Year*
Party	Congress approves main directions and military-technical policy		Defense Council approves draft main directions		Politburo approves draft Five-Year Plan
Military	NII-MOs (military scientific research institutes) contract for research to substantiate the main directions of military development		Deputy Minister of Defense for Armaments integrates and aggregates main directions with General Staff	Technical directorates prepare requirements for new systems and technologies	Drafts of "Plan for Military Construction" and "Plan of Most Important NIR (scientific research work) and OKR (experimental design work)" approved
Ministries	Military Industrial Commission orders ministries to accept contracts from NII-MOs	Sectorial NIIs and KBs (design bureaus) conduct NIR on main directions	NIIs and KBs report the results of their research	NIIs and KBs begin to respond to draft requirements	Ministries finalize Five-Year Plan

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Since the 27th Party Congress in January 1986, we have seen a new formulation. The Soviets now talk about "reasonable, sufficient defense." One writer states that sufficiency is defined primarily by the requirement for defense against aggression.

According to Marshal Sergey Akhromeyev, Chief of the General Staff, a military doctrine was being developed in early 1987 based on new party policy—that of maintaining the USSR's defense capability at a strictly necessary level to preclude military-strategic superiority on the part of adversaries.

In terms of military technology, we estimate that the principal impact of the new doctrine will be apparent in the force levels of the 1990s and the weapons approaching initial operational capability in the latter half of the 1990s. The Soviets are in the process of identifying their military-strategic goals for the period through 2005 and the economic, operational-tactical, and military-technical measures to be undertaken during the 13th Five-Year Plan (1991-95) in support of those goals. The new military doctrine will be a primary consideration during the establishment of the goals of the 13th Five-Year Plan. The decisions made regarding this plan will be the first complete implementation of the new policies and doctrine.

The Soviets claim that they now have greater flexibility, particularly in the political arena, in dealing with Western military-technical challenges. Nevertheless, we believe the Soviets remain locked in an offense-defense competition with the West. If the West fields a weapon more capable of accomplishing its mission, the multiple-launch rocket system (MLRS) for example, the Soviets respond with systems or tactics to frustrate that system, such as destruction of reconnaissance assets, jamming of artillery radio nets, or direct attack on the MLRS launcher. It is largely in the area of fielding similar types of weapons that the Soviets have a new flexibility. For example, they need not automatically develop an equivalent to the US Strategic Defense Initiative (SDI) or a stealth cruise missile.

Military-Technical Competition

Competition—but not as practiced in Western defense industrial companies—is a critical element in Soviet weapon development. Soviet weapon designers do not compete with each other; rather, they compete with Western military system designers. The object of this competition is the development of military systems with performance characteristics that meet or exceed those of comparable foreign systems, or which effectively counter foreign systems. We believe the Soviet military is interested in the technology content of weapons only insofar as the technology is important in attaining specified performance levels. Because of their schedule-dominant R&D process, Soviet designers tend to regard new technology as a source of risk in that it can delay their program schedules or even lead to failure.

Soviet writings show that qualitative competition has been part of Soviet military-technical policy for almost 25 years. These writings show that, since the early 1960s, Soviet missile designers were assigned what was described as "the most important national task"—the development of missiles superior to those of the United States in terms of basic characteristics.

More recent Soviet open-source literature shows that competition with the West continues to be a priority in military system development. An article by Soviet aircraft designer S. V. Ilyushin states, "The merits of an aircraft become clear only in comparison with others, usually foreign models of the same type."

Soviet military-technical competition with the West does not mean that the Soviets will always develop systems that are the technological equal of Western systems or that the Soviets will follow similar technological approaches in designing these systems. Rather,

Soviet Response to US SDI

The US SDI is forcing a response from the Soviet forecasting and planning system. Following the late 1985 Geneva summit, where General Secretary Mikhail Gorbachev and President Ronald Reagan failed to reach an agreement limiting SDI, the Soviets probably made a significant SDI-related research commitment. At the same time, the 12th Five-Year Plan was being finalized. Some of this commitment was apparently for NIR programs to develop technology.

The commitment of NIR resources in late 1985 was probably intended to develop technology that could support the start of some full-scale systems development programs (OKR) in the early 1990s, or the beginning of the 13th Five-Year Plan. This was the same period in which the United States was to decide whether and how to develop SDI systems, with initial deployment occurring in the late 1990-2000 time frame or beyond. If the Soviets were unsuccessful in stopping SDI by 1990, they would be able to judge, on the basis of their NIR effort, whether they should respond to SDI by developing similar systems or by concentrating on countermeasures, an advanced terminal ballistic missile defense system, or some other response. The Soviet commitment was almost certainly predicated on the United States following its SDI schedule as described in 1985.

The Soviets are concerned about the cost and technological challenges entailed in responding to the US SDI. Research is the cheapest part of the acquisition cycle and very large sums of money will be involved if they go into actual system development and eventual deployment. These funds would have to be diverted from other programs and could threaten Gorbachev's "restructuring" program. Even so, the Soviets must respond to SDI because they cannot be certain that an SDI-type architecture will not work. They fear that if the United States develops a working SDI system and they have not responded with countermeasures or their own advanced ballistic missile defense system, the United States will have achieved a first-strike capability. 25X1

An early US development decision (by 1988 or 1989) would force the Soviets to make some hard choices. 25X1 *To continue pacing the US SDI effort, the Soviets would have to make system development decisions in 1988 or 1989, even though their plans and programs had been formulated to arrive at system development decisions at the beginning of the 13th Five-Year Plan (1991 or 1992). Thus, the Soviets would have to begin system development before the technology development effort of the 12th Five-Year Plan is complete. They might have to divert already-allocated resources from the last two years of the 12th Five-Year Plan. We believe the Soviets would also continue their current NIR and OKR programs to deploy modified and improved versions as they become available.* 25X1

An early US decision to commence SDI development could affect and limit Soviet responses. The Soviets may not yet have the technology to support OKR in 25X1 *all possible responses—and they would have to develop their systems on a compressed schedule in order to begin deployment in the mid-1990s. Thus, the US SDI program has already affected Soviet forecasts and plans, even though the Soviets would rather not engage in such a costly competition. Their research and development schedule is also vulnerable to an early US decision to enter full-scale development.* 25X1 in areas of relative technological inferiority, forecasting and trend analysis of key performance characteristics should allow the Soviets to:

- Judge the status and prospects for their systems and technologies relative to the West.
- Focus resources for development—including requirements to acquire foreign technology.
- Develop technical approaches or operational-tactical adjustments that will allow Soviet systems to compete with, or counter, Western systems. [redacted]

[redacted]

[redacted] virtually all Soviet defense industrial ministries use data acquired on foreign systems in forecasting future systems. Many technology acquisition requirements are directed precisely to service forecasting efforts. [redacted] 25X1

[redacted] Western technology forecasts directly affect Soviet technology and military system development requirements. [redacted] 25X1 25X1

Prospects: Continued Incremental Change Using Proven Technology

We believe that the evolutionary character of Soviet military system development is not likely to change in the foreseeable future. Although the Soviets are beginning to develop more technologically complex weapons, they probably will continue to rely on incremental developments to existing systems for the majority of their weapons programs. By and large, the Soviets probably will continue to follow the West's lead in the development of technologies, although they do lead in a few areas. [redacted] 25X1 25X1 25X1

We believe obtaining information on Western military technology development and the performance of military systems based on this new technology will remain a priority Soviet intelligence requirement. Information on Western military systems and related technologies will continue to be a critical input for Soviet development decisions. [redacted] 25X1 25X1

[redacted] Reaction to Western developments—responding to a perceived or forecasted threat—will continue to be the principal characteristic of Soviet weapon system development. [redacted] 25X1 25X1

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Appendix

The Soviet Weapons Acquisition Process

This appendix is an orientation to that part of the Soviet weapons-acquisition process that follows the forecasting, planning, and requirements generation process. Where appropriate, we have made comparisons between the Soviet and US processes (see figure 5). [redacted]

Scientific Research Work

On the basis of requirements emanating from the main directions, Soviet military and industry undertake scientific research and technology development to lay the scientific-technical base (*nauchno-tekhnicheskiy zadel*) to support future development of new weapon systems. Scientific research work (*nauchno issledovatel'skaya rabota*), or NIR, is the bureaucratic process used to administer research and research-related activities. The conduct of scientific research work is specified in state standards (GOSTs). [redacted]

All military NIR can be considered goal-oriented (*tseleupravlennyy*) in that it is conducted within the context of a main direction—or mission-specific goal—and is intended to support the development of forecasted systems. The Soviets distinguish between exploratory (*poiskovoye issledovaniye*) and applied (*prikladnoye issledovaniye*) NIR research. They also refer to applied research as experimental research (*eksperimental'noye issledovaniye*). [redacted]

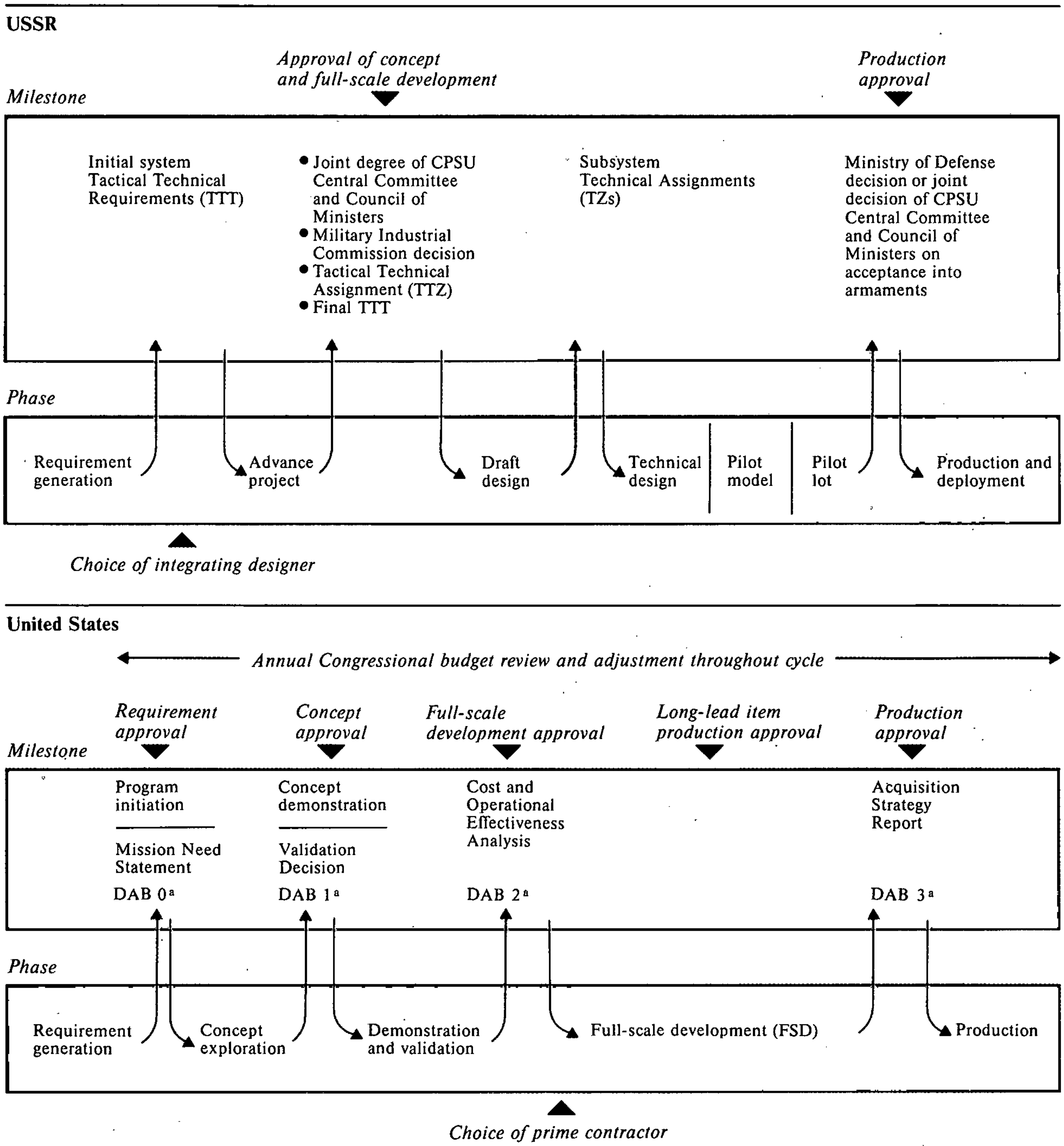
Exploratory research investigates ways of using scientific and technical discoveries and the results of fundamental research to develop models of prospective equipment. Applied research is conducted to develop technology and is directed at solving several clearly formulated scientific and technical problems. It examines the feasibility of using scientific results, concepts, or discoveries during the creation of equipment. The main goal of applied research is to make technology available to the designer. According to open sources, only a small percentage of innovations added to the scientific-technical base is used by designers. The Soviets consider the low rate of usage of new technology and the slowness of its introduction into production to be a principal weakness of their system. [redacted] 25X1

The conduct of NIR is governed by a technical assignment (*tekhnicheskoye zadaniye—TZ*) for NIR. 25X1
A TZ is the tasking document that initiates any research (NIR) or development (OKR) activity. [redacted] 25X1
[redacted] gives the following breakdown of NIR for 25X1
applied research in machine building and instrument building:

- Preparatory stage.
- Development of theoretical parts of the theme.
- Planning and preparation of test stands, test equipment, and controls.
- Experimental work—testing mockups and experimental models.
- Tests. 25X1
- Making corrections in the development and research (based on the tests).
- Experimental introduction of new technology.
- Deductions and proposals based on the research theme.
- Concluding stage, which could include developing a requirement for system development. [redacted] 25X1

Some Soviet writers do not include fundamental research (*fundamental'noye issledovaniye*) in the NIR process. 25X1 Fundamental research—also called pure (*chistiy*), theoretical (*teoreticheskiy*), or basic (*osnovnoy*) research—is conducted predominantly in the research institutes of the Academy of Sciences and higher education institutions. Fundamental research supplements knowledge of nature and society, reveals new laws, and leads to discoveries. It does not have application as a goal. Other Soviet authors acknowledge that fundamental research can be conducted within the context of an identified technology development effort (NIR) to study the physics underlying the technology. [redacted] 25X1

Figure 5
A Comparison of US and Soviet Weapon Procurement Cycles



[a] Defense Acquisition Board.

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It is important to note that there is often no clear dividing line between different types of research. According to one source, "In practice, when conducting goal-oriented scientific research, the boundaries between fundamental, exploratory, and applied research are frequently arbitrary. The difference between them consists mainly in the degree of uncertainty of final results and the duration of the time until the work being accomplished will have a visible effect." [redacted].

Experimental Design Work

The process of starting a military system development program is begun when one or more of the following occur:

- The main directions call for near-term development of a specific military capability.
- A NIR to establish the S&T base to enable development of a forecasted system is complete.
- An urgent, unforeseen requirement arises.

The main directorate responsible for a particular system writes an initial tactical-technical requirement (*taktiko-tekhnicheskoye trebovaniye*) for the desired weapon. From that, the directorate derives the tactical-technical assignment (*taktiko-tekhnicheskoye zadaniye*), which serves as a request for proposals to the design bureau. [redacted]

For major weapon programs, the next stage is advance design (*avanproyekt*), which is conducted as a NIR process. In conducting research for the advanced design, the military and the designer examine design alternatives that could meet the tactical-technical requirement. A decision is then made on the system concept most suitable for development. The military then prepares a tactical-technical economic substantiation (TTEhO) that addresses technical capability, operational suitability, and cost effectiveness of the prospective system. The advance design and TTEhO serve as the technical and economic basis for decision-making to proceed with the project. [redacted]

Whenever possible, the designer does not include in the advance plan any unproven technology that potentially would cause the program to fail or fall behind schedule. The designer includes newly available, production-ready technology from technology development (applied NIR) projects. As a result, a de facto technology freeze exists in the Soviet system at the outset of a weapon design project. [redacted]

High priority or costly weapon systems are authorized by a Politburo-level document called a joint decree (*sovmestnoye postanovleniye*) of the Central Committee and Council of Ministers. In the United States, this decree is equivalent to the Defense Acquisition Board obtaining Department of Defense (DOD) approval, assigning DX priority (priority resource allocation assigned by the National Security Council), and obtaining multiyear funding. Issuance of a joint decree is the major Soviet decision point in beginning a weapon development program and conducting it through final acceptance. After the go-ahead decision has been made, a tactical-technical assignment for development is formally issued to the integrating designer. The project then enters the OKR phase. [redacted]

Stages of Experimental Design Work

The weapon design project then proceeds through the draft design (*ehskiznyy proyekt*) stage. Although *ehskiznyy proyekt* is sometimes translated as concept design, it is not the same as concept design in the US acquisition process. This stage can take up to 30 months. Tasks carried out in the draft design phase include:

- Patent research.
- Workup of the optimal variant of the article being developed.
- Sketching out the basic assembly units (subsystems).
- Specifying more precisely the overall form of the article.
- Development of kinematic diagrams, cyclograms, or preliminary line diagrams.
- If necessary, making a mockup of the article being developed.
- Description of the structure and operation of the article.
- More precise specification of the technical and economic indexes.
- Drawing up design documents for mockups of individual assemblies with a view to checking the principles of operation of the article being developed and its parts.
- Submitting the results of draft design to a Scientific-Technical Council so that the project can be defended and can proceed to the technical design stage. [redacted]

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The draft design stage is followed by the technical design stage, which takes about two years. During technical design (*tekhnicheskiy proyekt*) the following tasks are carried out:

- Detailing the diagram and making technical calculations.
- Development of the sketches of the overall form.
- Determination of the possibility of using standardized and normalized assemblies and parts.
- Development of design sketches of individual assemblies.
- If necessary, making mockups to verify the design solution of the product or its integral parts.
- Compilation of detailed specifications.
- Estimates of durability.
- Studies of materials, assemblies, and parts.
- Submission of the results of technical design to a scientific-technical council for approval to proceed to the next stage.

By the end of the technical design phase, the designer and subcontractors will have a complete outline of the new system. A design freeze of the overall design configuration occurs when the technical design is approved by the military customer.

The weapon system now enters working design (*rabochiy proyekt*), which takes four to six years. In working design, detailed drawings of all parts are made. The main goal of working design is to produce a well-documented pilot model or prototype (*opytnyy obrazets*) of the complete system that will pass state acceptance tests (*gosudarstvennyye priyemochnyye ispytaniya*). Throughout the OKR stages, mockups will be constructed to test the function of proposed systems and the fit and layout of subsystems or to plan the running of hydraulic or electrical systems.

Toward the end of working design, the designer puts the system prototypes through factory or designer's tests (*zavodskiye* or *konstruktorskiye ispytaniya*). Early flight tests of a new missile would be considered designer's flight tests. At the end of these tests, fully developed, well-documented prototypes will be submitted for state acceptance tests. These tests are conducted by the customer (the military) and will test the performance of the new system and its reliability, resistance to environmental stresses, and suitability for operation by the troops. Upon completion of state acceptance tests, the new system is accepted into the armament (*prinyatiye na vooruzheniye*) and cleared for production. The designer transfers production drawings and documentation to the factories and maintains a reduced staff devoted to the system for the entire time it is in service. The OKR process ends with transfer of the weapon into production. 25X1

Acceptance into the armament milestone is not deployment—it is better to regard a Soviet system as reaching initial operational capability when it first goes on combat duty (*na boevom dezhurstve*). Combat duty is defined by the *Soviet Military Encyclopedia* as "the maintenance of specially designated forces and means at a level of high military readiness for solving quick-reaction tasks or conducting military operations.' 25X1

Comparison of the US and Soviet Acquisition Cycles

It is important to note the asymmetries in the weapons acquisition processes of the United States and the Soviet Union. Although the processes appear similar, there are major conceptual differences. The US process is *performance-oriented* and optimized to allow competition until late in the process. As a result, technology and design freezes occur late in the process. The Soviets rely on a settled community of specialized research and development entities that rarely compete. Their *schedule-dominated* style makes the Soviets risk-averse. To minimize risk, they make technology and overall design choices before proceeding to system development. In the United States, competitive demonstration and validation is conducted before entering full-scale system development, with the object being proof of design concept rather than development of hardware for service use. During the same relative time frame in the USSR, a single system program conducted by a single development organization involving one design concept has been defined and is under way.

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Despite these differences, the Soviet stages of research and development have some activities that are comparable to activities in the US DOD Program 6. Program 6 is one of 10 major defense programs in the US Five-Year Defense Program. It consists of all research and development programs and activities not yet approved for operational use. Program 6 includes basic and applied research tasks; projects with potential military application; and the development, testing, and evaluation of new weapon systems and related equipment:

- Research in scientific problems with military applications (Program 6.1) is conducted by US military laboratories, universities, research centers, and industrial laboratories. It is generally similar to fundamental research activities conducted in the USSR by Academy of Science, university, and industrial institutes. In the United States and the USSR, the work is directed towards creating a phenomena base for technological research—for example, oceanographic studies for antisubmarine warfare applications.

- Exploratory development (Program 6.2) builds the foundation for application of specific technologies for general types of weapons.

- Advanced technology development (Program 6.3a) evaluates the feasibility of using new technology in solving specific types of military problems.

- The Soviet concept of exploratory research (NIR) is similar to Programs 6.2 and 6.3a in that it looks at development of technology for general use and for mission-specific applications. As stated earlier, the NIR divisions into exploratory and applied research are somewhat arbitrary, thus making correlations with US stages inexact.

- The concept definition phase (Program 6.3b) is much like Soviet applied research themes (NIR) conducted by military and defense industrial institutes during their advance design phase just prior to OKR. In both countries, alternative designs are proposed for further development. The advanced technology development conducted during Program 6.3b is system-specific development of subsystems. In the USSR, comparable development usually takes place beginning in the early stages of OKR—draft and technical design.

- Full-scale engineering development (Program 6.4) is the stage of a specific system authorized for eventual deployment. This is somewhat similar to Soviet experimental design work (OKR), where blueprints are prepared, design reviews are conducted, and prototypes are tested with production as a goal.

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